Intelligent Public Transport Information System

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Abstract— **To increase the usability of a public transport system it needs to go under revolutionary changes in its operating procedure. It is an attempt to make this possible using recent computer technology, mobile computing advancements and Wi-Fi or GPRS. The Intelligent Public Transport Information System will be specifically developed for Bus Transport. In this System passenger can get information about all buses, routes, timings of buses and all stops in any particular route. This system includes two phases. One is for user and other for administrator. At user side, user can request for information about all buses, routes, timings of buses and all stops in any particular route using Wi-Fi or GPRS technology from his mobile or PDA. At administrator side, administrator can update, delete and insert information about all buses, routes, timings of buses, all stops in any particular route and helpline numbers. Administrator can have all rights about database operations.**

Keywords- Public Transport Information System, Mobile Client, Web service, SOAP (Simple Object Access Protocol), CLDC (Connected Limited devices Configuration).

I. INTRODUCTION

As mobile devices become smaller, cheaper, better and more connected, they are changing the way people access and work with information. The convenience and powerful functionality offered by mobile devices such as PDAs, has encouraged many industries to investigate the benefits of using them. Wireless and handheld devices abound as vendors pitch the common themes of one-to-one computing, instant communication and anytime, anywhere information access [2]. Originally, the PDA was intended to be an electronic version of a "personal organizer"; however, with the introduction of more powerful CPUs, operating systems and memory, today's PDAs are being customized for great variety of applications. Unlike desktop PCs and laptops, mobile devices have many constraints such as screen display size, interaction techniques and bandwidth over mobile networks [3]. Despite these constraints, PDAs are the preferred mobile device for business applications because they are highly portable, have the ability to communicate with PCs and can access information from remote locations. Transportation system is the key factor in the development of a particular region. With the development of city, a need for powerful transport is generated. The network of this system is vast and ever increasing. So it is very difficult to get the correct information about buses, their timings and routes. So our current project is entitled to help the user in all ways. The Intelligent Public Transport Information System will be specifically developed for Bus Transport. In this System passenger can get information about all buses, routes, timings of buses and all stops in any particular route.

This project includes two phases. One is for user and other for administrator. At user side, user can request for information about all buses, routes, timings of buses and all stops in any particular route using Wi-Fi or GPRS technology. At administrator side, administrator can update, delete and insert information about all buses, routes, timings of buses, all stops in any particular route and helpline numbers.

II. SYSTEM OBJECTIVES

The objectives of this project are:

1. To design and implement data access points and client applications for transport information system on web based application or Internet.
2. To develop transport information system using a suitable interface with the computer.
3. To help passengers, administrator in transport information system using Mobile application and Wi-Fi or GPRS technology.

III. LITERATURE SURVEY

A. *J2ME*

Sun Microsystems defines J2ME as "a highly optimized Java run-time environment targeting a wide range of consumer products, including pagers, cellular phones, screen-phones, digital set-top boxes and car navigation systems." Announced in June 1999 at the Java One Developer Conference, J2ME brings the cross-platform functionality of the Java language to smaller devices, allowing mobile wireless devices to share applications. With J2ME, Sun has adapted the Java platform for consumer products that incorporate or are based on small computing devices.

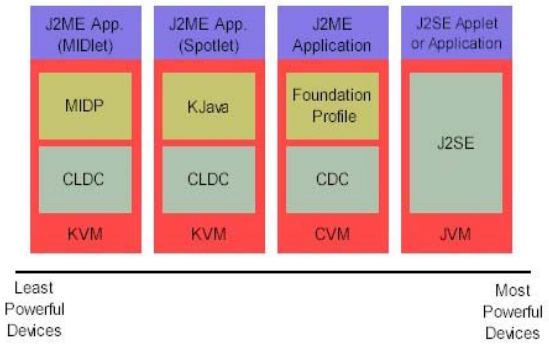

Figure 1 General J2ME Architecture

B. *MIDlet:*

The Mobile Information Device Profile (MIDP) is geared toward devices like cellular phones and pagers. MIDP, like KJava, also is built upon CLDC. The MID Profile provides a standard run-time environment that allows new applications and services to be deployed dynamically on end-user devices. Now we will see MIDlet life cycle,

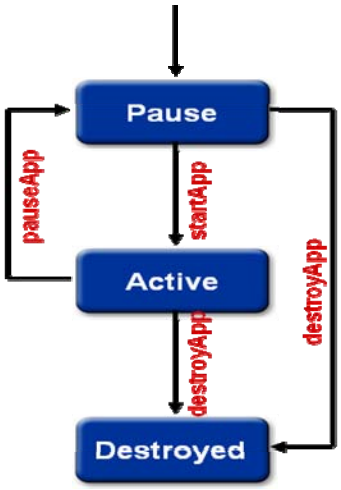

Figure 2 MIDlet Life Cycle

- A MIDlet is a Java class that extends the javax.microedition.midlet.MIDlet abstract class. It implements the startApp(), pauseApp(), and destroyApp() methods, which you can think of as being similar to J2SE's start(), stop(), and destroy() methods in the java.applet.Applet class. MIDP applications are known as “MIDlets”
- MIDlets move from state to state in the lifecycle, as indicated.
  - Start – acquire resources and start executing
  - Pause – release resources and become quiescent (wait)
  - Destroy – release all resources, destroy threads, and end all activity

IV. METHODOLOGY

A. *Design Overview*

The passenger requests from mobile application and the web server responses consist of a multiple series of discrete requests and responses (see Figure I) which represent the various stages of data between a mobile

application and web server (see Figure I). This data transfer mechanism is best suited for devices with mobile application and valid network connectivity for transportation system. The following block diagram also explains about system design.

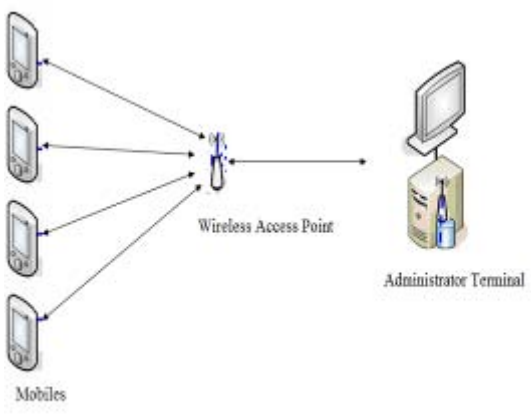

Figure 3 Logical Wireless Diagram

Intelligent Public Transport Information System can be developed using 802.11g and J2ME technology. The system architecture includes the following components:

1. The first part i.e. Mobile Application will be written using J2ME technology for a Wi-Fi/GPRS enabled device and its communication with a centralized database located on a server and Wi-Fi/GPRS enabled device.
2. A Centralized Relational Database (CRD) developed using MySQL.
1. Server Side software written using J2SE

to administer the database from the administrative terminal.

2. Wireless connectivity using 802.11g standard

between a Wi-Fi/GPRS enabled device (mobile) and a web server.

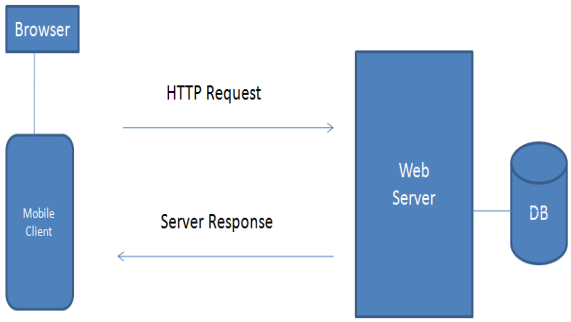

Figure 4 System Overview

The Transport Information System needs to request to Server for information from a small computing device (e.g. Mobile, PDA, etc) through the internet by using SOAP protocol. For placing a request Client can use the Transport Information System application in a small computing device (e.g. Mobile, PDA, etc) which have Wi-Fi support. The client program in the small computing device provides the information menu for the passenger. After any request is received from client, server will give reply to the client.

The overall system architecture is shown below (See figure II).

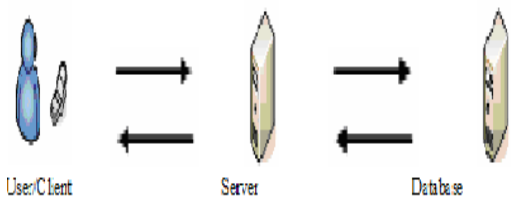

Figure 5 System Architecture

System architecture clearly shows the transfer of request and response. The three active entities are User or Client, Server and the Database. User request is sent to server and the server in turn contacts the database for configuring the response to user request. The response is then sent to client by server.

B. Deployment of Mobile Application

The developed mobile application will be deployed to the users after completion for use. The process is very simple and automated and is shown below in the diagram. User needs to search for the application on web where it will be hosted and needs to be downloaded.

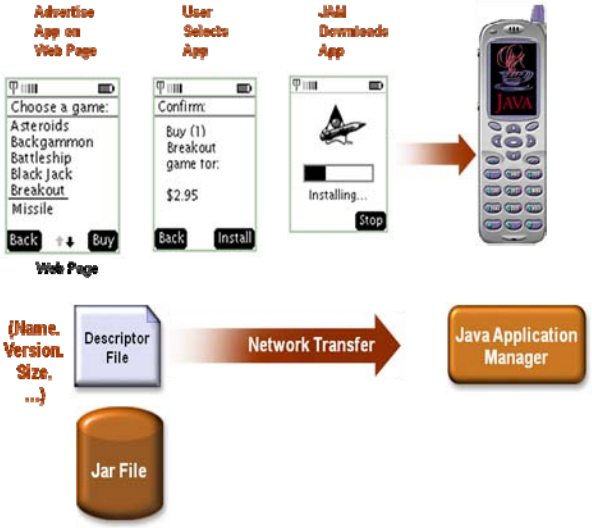

Figure 6 Deploying Mobile Application

V. DESIGN AND IMPLEMENTATION

We will see implementation details of the system components one by one.

A. Centralized Database Design

We use MySQL as database. The database is the core of the IPTIS (Intelligent Public Transport Information System). The mobile client will communicate with the database to get the information for the system. It contains the table to store data and the graphical user interface to access the database. The whole data resides on server. Database is organized as relational database i.e. data is stored in the form of tables. Following tables are used to store data:

1) Bus_no_details table: This table is used to store *bus_no* and after adding, every *bus_no* will have auto generated *bus_id* which is a primary key and avoids duplicates.
2) Stop_details table: This table stores list of stops and each is given *stop_id*. Both *stop_name* and *stop_id* are primary keys.
3) Bus_route_details table: This table stores details of a particular route which include all stops in that route, the timing bus arrives there and fare up to that stop. Every route is given route_id. Three columns in this table are *route_id*, *route_details* and *bus_id*.
4) Helpline details table: This table stores *depot_names* and their *contact_number* for emergency contact facility.

B. Administrator Side Design

Administrator side is for the use by Administrator which here stands for Depot Manager specifically. This side is developed as web based interface so that it can be hosted on internet and passengers can use search facility through their mobiles 24*7 using GPRS. This is developed using JSP (Java Server Pages) and Java Servlets are used to handle database operations and automatic response generation in case of search option.

1) Admin Login Form: The first page is authentication page to limit the access to required people only and its GUI is as shown below.

Figure 7 Admin Login

Without password, nobody is allowed to log to the system.

2) Route Entry Form: This is to enter route into the database. Depot Manager has to enter route for every new bus added to the depot. Sample GUI is shown below.

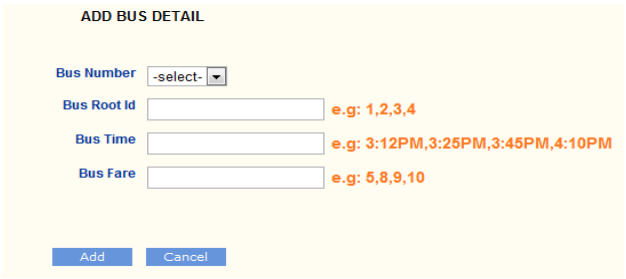

Figure 8 Route Entry form

Here the format in which to enter the data is shown for the convenience of user so that data is provided to database correctly. Likewise the forms for adding buses, stops are designed and options for deleting, updating are provided.

C. Passenger Side Design

Passenger side is a mobile application developed using J2ME (Java 2 Micro Edition CLDC 1.1). User should install this application in his mobile to avail of the system. For this mobile should have Wi-Fi facility. After installation this application is available as other general apps provided with mobile.

1) *Search Option Form:* This form asks the user to enter source and destination of his interest and then sends the data to server for further processing when user clicks *Ok* from menu options. Its GUI is shown below.

Figure 9 Search Option Form

It is provided with two editable text boxes, one each for source and destination.

2) Result Display Form: After user submits the information, response is sent from server and is displayed on user mobile. Technical details we will see afterwards. Result consists of Bus Number, Stop name, time and fare up to that stop.
e.g. If source is Alandi and destination is Bhosari then one of the result entry would be like
20 – dehuphata – 8:25AM - 2

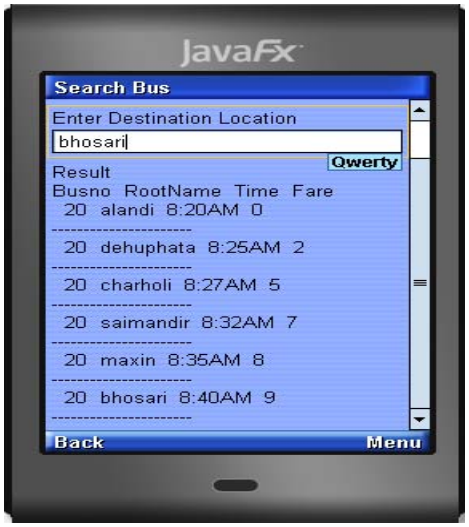

Figure 10 Result Display Form.

D. Connection with Server

1) When user presses Ok button after entering search data, automatically a HttpConnection is created with the distant Server.
2) Using SOAP (Simple Object Access Protocol) the parameters are sent to Server and the intended Servelet is invoked and gets executed. The output data is sent to the invoking mobile device.
3.)The sent data is displayed to the screen in particular fashion.
4.)The communication takes place over Wireless media.

VI. LIMITATIONS

After configuring the equipment, the testing was done successfully using one mobile. Testing using more than one mobile is not yet completed; however, considering the system's simple operation we do not see any technical issues. Due to present vulnerabilities in wireless technology, this system may not be secure enough to defend itself against attacks. However, considering the nature of the application, we strongly believe WPA is secure enough for request and reply.

VII. APPLICATIONS

Applications of this project are:
1) Will improve the city bus transport system.
2)Aid the naive passengers get information without a word of scold.
3)Empower the city bus transport system with the newest technology.
4)Increasing the productivity and profit gains of the public transport system.

VIII. FUTURE WORK

In addition to mobile and wireless technology, the location identification feature provided by Global Positioning System (GPS) can be integrated into IPTIS to deliver latest information to passengers. The current system shows only buses, their routes, and distances to user. But it can be further extended to show the exact position of the buses to the user using GPS. For this every bus must have a GPS transmitter which will send information to the server. A server then sends position information.

IX. CONCLUSION

On overall, the project design will achieve its objectives. The project will provide a client/server application for public transport system and can successfully built using J2SE, J2ME software. It will provide a more convenient and accurate method for retrieving the information about bus details. Users will have all the information about bus details on their finger tips.

The mobile devices have been widely used to provide easily access to the web content. We presented a wireless Public Transport System based on web services over a wireless integrated wide area network, which will implement wireless data access to the servers and IPTIS system functions through both desktop PCs and mobile devices. The system will be based on secure web service architecture and can increase efficiency for transport system by reducing human errors and by providing higher quality customer service.

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